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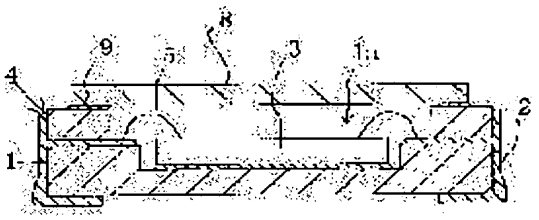
(54) WIRING BOARD

(57)Abstract:
PROBLEM TO BE SOLVED: To overcome the problem that a portion of a external connecting conductor formed on the side face of an insulating board is extended or deformed so as to generate a protruded defect when a multi-wiring board is divided into multiple wiring boards.
SOLUTION: The wiring board comprises the insulating board 1 having a mounting part 1a on which electronic components are mounted, and the external connecting conductor 2 which is led out to the lower surface from the periphery of the mounting part 1a via the side face of the insulating board 1. When the thickness of the external connecting conductor 2 in a corner A formed of the side face and the lower surface of the wiring board 1 is T1, and the thickness of the conductor 2 in a central region B in the thickness direction of the insulating board 1 is T2, $0.4T1 \leq T2 \leq 0.75T1$ and $8\ \mu m \leq T2 \leq 12\ \mu m$ are obtained.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] It is the wiring substrate which consists of a conductor. the insulating base which has the loading section by which electronic parts are carried in a top face, and the object for external connection derived from said loading section circumference on the underside through the side face of an insulating base — said object for external connection — the wiring substrate characterized by conductors being 0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T when thickness in the central field of T1 and the thickness direction of an insulating base is set to T2 for the thickness in the corner field formed on the side face and underside of a wiring substrate.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] About the wiring substrate for carrying electronic parts, such as a semiconductor device and a capacitative element, this invention relates to the wiring substrate which divides into each substrate according to the so-called chocolate breaking, and is obtained, after calcinating a picking substrate much in detail.
[0002]
[Description of the Prior Art] the object for external connection which the wiring substrate for carrying electronic parts, such as a semiconductor device and a capacitative element, conventionally consists of refractory metal ingredients, such as an insulating base which generally consists of the nature sintered compact of an aluminum oxide, and has the loading section of electronic parts on the top face, and a tungsten, molybdenum, and is derived from the loading section circumference of an insulating base on the underside through a side face — it consists of conductors.
[0003] and — while carrying out loading immobilization of the electronic parts at the loading section of an insulating base — each electrode of electronic parts — the object for external connection of the loading section circumference — after connecting with a conductor electrically, it becomes an electronic instrument as a product by closing electronic parts by the lid or the resin for closure if needed. this electronic instrument — the object for external connection — the electronic parts with which the part drawn from the side face of an insulating base by the underside among conductors was connected and carried in the external electrical circuit through low-melt point point low material, such as solder, — the object for external connection — it connects with an external electrical circuit and an electric target through a conductor.
[0004] With the miniaturization of the latest electronic instrument, the magnitude is the very small thing which is several mm angle extent, and the fabrication is faced such a wiring substrate. after baking — an insulating radical, while arranging the field used as [two or more] the insulating base of a part in a list in every direction and forming it in the ceramic green sheet layered product of the extensive area used as the mother substrate of the body and its function in one By forming in the vertical side of this layered product the division slot divided to the field used as each insulating base in the predetermined depth, and dividing the aggregate of two or more wiring substrates which calcinated and obtained this along a division slot (chocolate breaking) Manufacturing many intensively (many picking) is performed.
[0005] the object for external connection of said wiring substrate — the part which is missing from a side face and is drawn from the loading section circumference of an insulating base among conductors, and the part formed in an underside

are formed in the front face of the ceramic green sheet used as a mother substrate by carrying out printing spreading of the conductive paste, such as a tungsten and molybdenum, with screen printing at the predetermined pattern.

[0006] moreover, said object for external connection -- the location where, as for the part by which covering formation is carried out, the division slot of said ceramic green sheet layered product is formed in the side face of an insulating base among conductors -- a parting line -- straddling -- making -- a breakthrough -- forming -- the internal surface of this breakthrough -- meeting -- conductive paste -- the object for external connection -- it is formed by carrying out printing spreading, as it connects with the part drawn from the loading section circumference of a conductor. in this case, the conductive paste by which 2 ****s was carried out, and it was calcinated [were calcinated and the breakthrough was also printing-applied] on the notching section front face when dividing the aggregate of said wiring substrate along a division slot -- the object for external connection of the side face of a wiring substrate -- it becomes a conductor.

[0007] Moreover, printing spreading of the conductive paste to the internal surface of the breakthrough formed in the ceramic green sheet layered product gives vacuum attraction from the other end side of a breakthrough while supplying conductive paste to the interior through screen platemaking etc. from the end side of a breakthrough, it meets an inner-wall-of-through-hole side, and as the conductive paste of optimum dose remains and puts it, it is performed. In addition, the conductive paste to which the conductive paste at this time is carried out comparatively highly with about 500-1500poise (about 50 to 150 Pa-S) so that optimum dose may remain along an inner-wall-of-through-hole side, and it was applied serves as thickness of about 20 micrometers - about 25 micrometers all over the districts mostly.

[0008]

[Problem(s) to be Solved by the Invention] however, with the wiring substrate obtained by carrying out chocolate breaking along a division slot, the aggregate of a wiring substrate as mentioned above It is easy to extend, when the thickness of the conductive paste (for external connection conductor) applied and formed is comparatively as thick as about 20 micrometers - 25 micrometers to the internal surface of a breakthrough and stress joins it, Moreover, a division slot will reach even a certain amount of depth, but it will be divided by fracturing a mother substrate by the momentarily big tensile stress in the central field of the thickness direction of an insulating base. this time -- the object for external connection -- the external connection formed in the side face of an insulating base since big stress joins a conductor -- as some conductors were prolonged outside, it projected and deformation and the problem of producing a poor appearance, the defect of an electrical property, etc. were in the wiring substrate.

[0009] especially -- the object for external connection -- in order to attain low electric-resistance-ization of a conductor -- an insulating base -- low-temperature baking ingredients, such as a glass ceramic sintered compact, -- forming -- the object for external connection -- the object for external connection of the side face of the above wiring substrate since the case where a conductor is formed with the copper of low electric resistance, silver, gold, or its alloy increases and such copper and silver, and gold have malleability and large ductility -- generating of the stretch deformation and projection of a conductor is becoming remarkable.

[0010] moreover, the object for external connection -- what is formed in the side face of a wiring substrate among conductors since it is the thickness almost same in the whole region -- the above objects for external connection, if the amount of printings of conductive paste is reduced and it is made for spreading thickness to become thin (all over the districts), in order to prevent stretch and deformation of a conductor this object for external connection -- the time of connecting a conductor to an external electrical circuit through low-melt point point low material -- the object for external connection -- bonding strength of the low-melt point point low material to a conductor cannot be secured, but the problem that a wiring substrate is not firmly connectable with an external electrical circuit is induced.

[0011] this invention is thought out in view of the above-mentioned conventional problem -- having -- the object -- for example, the object for external connection -- ****** the conductor was formed with the big metallic material of the malleability of copper, silver, etc., and ductility -- the object for external connection -- it extends in a conductor, and problems, such as deformation and projection, do not occur, and it is in offering the wiring substrate which can be firmly connected with an external electrical circuit substrate.

[0012]

[Means for Solving the Problem] The insulating base in which the wiring substrate of this invention has the loading section by which electronic parts are carried in a top face, It is the wiring substrate which consists of a conductor. the object for external connection derived from said loading section circumference on the underside through the side face of an

insulating base -- said object for external connection -- a conductor is characterized by being 0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T, when thickness in the central field of T1 and the thickness direction of an insulating base is set to T2 for the thickness in the corner field formed on the side face and underside of a wiring substrate.

[0013] according to the wiring substrate of this invention -- the object for external connection -- the thickness in the corner field formed among conductors on the side face and underside of a wiring substrate, when thickness in the central field of T1 and the thickness direction of an insulating base is set to T2 From having considered as 0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T the object for external connection, even if big stress is added, when it can be made hard to make thin thickness in the central field of the thickness direction of an insulating base among conductors, and to extend and a mother substrate is divided (chocolate breaking) the object for external connection -- it can prevent effectively that do not stretch-deform, a conductor does not project greatly and the nonconformity on an appearance and a property occurs in a wiring substrate.

[0014] moreover -- simultaneously according to the wiring substrate of this invention -- the object for external connection -- the thickness T1 in the corner field formed among conductors on the side face and underside of an insulating base from a thick thing compared with T2 the object for external connection, when a conductor is connected to an external electrical circuit through low-melt point point low material the thickness of enough conductors to join low-melt point point low material firmly -- the insulating base lower circumference -- being securable -- low-melt point point low material and the object for external connection -- junction to a conductor can be strengthened and a wiring substrate can be firmly joined to an external electrical circuit substrate.

[0015] moreover -- according to the wiring substrate of this invention -- the side face of an insulating base -- setting -- the object for external connection -- from a soffit differing in the thickness of a conductor from a central field the object for external connection -- the outside surface of a conductor -- the soffit from a central field -- applying -- the shape of a curved surface, and the shape of non-plane [of stair-like **] -- changing -- this object for external connection, since the junction interface of a conductor and low-melt point point low material also becomes non-plane [-like] the object for external connection -- when stress, such as thermal stress, joins the junction interface of a conductor and low-melt point point low material, this stress is distributed in the many directions -- it can make -- the object for external connection -- connection dependability of the low-melt point point low material to a conductor can be made good, and connection dependability over the external electrical circuit substrate of a wiring substrate can be made good.

[0016]

[Embodiment of the Invention] Next, this invention is explained to a detail based on an attached drawing. one example when drawing 1 applies the wiring substrate of this invention to the package for semiconductor device receipt which holds the object for semiconductor device receipt -- being shown -- 1 -- an insulating base and 2 -- the object for external connection -- it is a conductor. these insulating bases 1 and the object for external connection -- the wiring substrate 4 for carrying a semiconductor device 3 with a conductor 2 is formed.

[0017] It consists of electrical insulation materials, such as a glass ceramic sintered compact and a nature sintered compact of an aluminum oxide, and has loading section 1a which carries a semiconductor device 3 in the top face, and a semiconductor device 3 minds binders, such as glass, resin, and low material, it is adhesion-fixed and said insulating base 1 is carried in this loading section 1a.

[0018] This insulating base 1 is manufactured from the mother substrate for the so-called many picking. Put in order the field which specifically become the ceramic green sheet layered product of the extensive area which serves as a mother substrate for insulating base 1 after baking with the insulating base 1 of a part in all directions, and array formation is carried out in one. The division slot which divides the field which serves as each insulating base 1 by putting slitting into the underside or vertical side of this layered product with a cutter cutting edge or press metal mold is formed. Next, many is manufactured simultaneously intensively by obtaining the aggregate with which this was calcinated and two or more insulating bases 1 were formed in one into the mother substrate at the list in every direction, and carrying out chocolate breaking of this aggregate along a division slot.

[0019] moreover, the object for external connection which derives said insulating base 1 from the loading section 1a circumference in which the semiconductor device 3 of the top face is carried on the underside through a side face -- covering formation of the conductor 2 is carried out.

[0020] said object for external connection — the electrode of a semiconductor device 3 is connected to the part of the loading section 1a circumference of an insulating base 1 through bonding wire 5 grade, and a conductor 2 is shown in drawing 2 — as — the side-face part and underside part of an insulating base 1 — wiring of an external electrical circuit substrate — it connects with a conductor 6 through the low-melt point point low material 7.

[0021] such an object for external connection — a conductor 2 is formed by carrying out printing spreading of the conductive paste which kneads powder, such as copper, silver, and gold, on the front face of the ceramic green sheet used as an insulating base 1 (mother substrate), and the side face of the field used as each wiring substrate of a ceramic green sheet layered product with an organic solvent and a binder, and grows into them at the predetermined pattern, when an insulating base 1 consists of a glass ceramic sintered compact. In this case, it is necessary to prepare openings, such as a breakthrough, in a ceramic green sheet layered product beforehand so that conductive paste can be applied to the field used as the side face of the insulating base 1 of a ceramic green sheet layered product. 2 ****s of the conductive paste printed by the side face of each field used as the insulating base 1 of a ceramic green sheet layered product are carried out by carrying out chocolate breaking of the mother substrate after baking — having — the object for external connection — it becomes the side-face part of an insulating base 1 among conductors 2.

[0022] In addition, said division slot is formed from the underside of a mother substrate in about 1 / about five to 1/3 depth of the thickness of a mother substrate, and chocolate breaking applies stress so that it may bend caudad along this division slot, and it is performed by making the central field of the thickness direction of a mother substrate at which a division slot has not arrived divide with stress (hauling).

[0023] this invention — setting — said object for external connection — it is important about a conductor 2 to make into 0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T thickness in the corner field A formed on the side face and underside of the wiring substrate 4, when thickness in the central field B of T1 and the thickness direction of an insulating base 1 is set to T2.

[0024] said object for external connection — by making thin thickness T2 in the central field B of the thickness direction of an insulating base 1 about a conductor 2, so that the relational expression of 0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T may be satisfied It can be made hard to extend though the conductor 2 was formed with the big metallic material of copper malleability and ductility. the object for external connection — the time of dividing a mother substrate (chocolate breaking) — the object for external connection, when big stress joins the center-section part B of the thickness direction of an insulating base 1 among conductors 2 the object for external connection — it can prevent effectively that do not stretch-deform, a conductor 2 does not project greatly and the nonconformity on an appearance and a property occurs in the wiring substrate 4.

[0025] moreover, the object for external connection — the object for external connection since thickness T1 in the corner field A formed among conductors 2 on the side face and underside of an insulating base 1 is thickened — a conductor 2 — the low-melt point point low material 7 — minding — wiring of an external electrical circuit substrate, when it connects with a conductor 6 The thickness of enough conductors to join firmly the low-melt point point low material 7 can be secured, and the wiring substrate 4 can be firmly joined to an external electrical circuit substrate.

[0026] moreover, the corner A formed on the side face and underside of an insulating base 1 to the central field B — the object for external connection — from the thickness of a conductor 2 differing the object for external connection — the outside surface of a conductor 2 — the central field B from said corner A — applying — the shape of non-plane (the shape of a curved surface [The example of drawing 2]) — changing — this object for external connection, since the junction interface of a conductor 2 and the low-melt point point low material 7 also becomes non-plane [-like] the object for external connection, when stress, such as thermal stress resulting from the difference of the coefficient of thermal expansion of an insulating base 1 and an external electrical circuit substrate, joins the junction interface of a conductor 2 and the low-melt point point low material 7 this stress is distributed in the many directions in accordance with said junction interface — it can make — the object for external connection — connection dependability of the low-melt point point low material 7 to a conductor 2 can be made very good.

[0027] The thickness of a conductor 2 becomes inadequate. in this case, T — if it becomes thin too much with 2< 8 micrometers — the object for the external connection in the central field B of the thickness direction of an insulating base 1 — the object for external connection, if the bonding strength of a conductor 2 and the low-melt point point low material 7 runs short, and the wiring substrate 4 cannot be firmly joined to an external electrical circuit substrate and it becomes

thick too much with T2>12micrometer the time of carrying out chocolate breaking of the mother substrate along a division slot — the object for external connection — the stress which acts on a conductor 2 — the object for external connection — a conductor 2 is pulled outside and it extends, and it will deform and a projection will be generated. therefore, said object for external connection — it is necessary to make thickness T2 in the central field B of the thickness direction of an insulating base 1 of a conductor 2 into the range of 2<=12 micrometers of 8 micrometer<=T

[0028] Moreover, when it comes to T2<0.4T1, compared with T2, the thickness of T1 becomes large too much. the part of the thickness of T1 — setting — the object for external connection, since the difference of the thickness of T1 and T2 is small if nonconformities, such as lowering of covering reinforcement to the insulating base 1 of a conductor 2, are produced and it is set to T2>0.75T1 the part of the thickness of T1 — setting — the object for external connection — the thickness of a conductor 2 — imperfection — becoming — the object for external connection — it will become impossible to join firmly the low-melt point point low material 7 to a conductor 2, and to connect the wiring substrate 4 to an external electrical circuit substrate firmly therefore, said object for external connection — about a conductor 2, when thickness in the central field B of T1 and the thickness direction of an insulating base 1 is set to T2, T1 and T2 need to make thickness in the corner field A formed on the side face and underside of the wiring substrate 4 the range of 0.4T1 <=T2 <=0.75T1.

[0029] in addition, said object for external connection — it may make the boundary part of the field (the corner field A formed on the side face and the underside of the wiring substrate 4) of thickness T1 and the field (the central field B of an insulating base 1) of thickness T2 connected the shape of a stage, and in the shape of an inclined plane about a conductor 2, as were shown in drawing 2 , and shown not only in what is connected in the shape of a smooth surface so that thickness may change continuously but in drawing 3 (a), and (b)

[0030] moreover , said object for external connection — if the conductor 2 make the plating layer which consist of the metal excellent in the corrosion resistance of nickel , copper , gold , etc. , etc. , bonding nature , the wettability of low-melt point point low material , etc. put on the exposure front face — the object for external connection — while being able to prevent the oxidization corrosion of a conductor 2 effectively — the object for external connection — a bonding wire 5 and the low-melt point point low material 7 be firmly [much more certainly and] connectable with a conductor 2 . therefore, said object for external connection — as for a conductor 2, it is desirable to make it cover so that it may be served as to 1-10 micrometers in the thickness of 1-20 micrometers, for example, a nickel-plating layer, and it may serve as [layers / (not shown) /, such as nickel, copper, and gold, / plating] thickness of 0.03-3 micrometers in a gilding layer on the exposure front face. You may make it change suitably according to the part of a conductor 2. in addition, the thickness of said plating layer — the object for external connection — For example, thicken the gilding layer of a part to which a bonding wire 5 is connected with 1.5-3 micrometers, and bonding nature is made high. As thickness of the gilding layer of a part to which the low-melt point point low material 7 is connected is made thin with 0.03-0.5 micrometers, generation of intermetallic compounds, such as golden-tin, is suppressed, and you may make it raise further the connection dependability of the low-melt point point low material 7.

[0031] Next, an example of the manufacture approach of the above-mentioned wiring substrate 4 is explained to a detail based on drawing 4 (a) thru/or (e). In addition, in drawing 4 (a) thru/or (e), the same sign is given to the same part as drawing 1 thru/or drawing 3 .

[0032] Drawing 4 (a) thru/or (e) are the sectional views for every process for explaining the manufacture approach of the above-mentioned wiring substrate 4, and as first shown in drawing 4 (a), it forms two or more ceramic green sheets 21 of extensive area.

[0033] When an insulating base 1 consists of a glass ceramic sintered compact, said ceramic green sheet 21 is formed by fabricating this slurry object by the doctor blade method, the calendering roll method, etc. in the shape of a sheet while carrying out addition mixing of the suitable organic binder for raw material powder, such as HOU silicic acid system glass, an aluminum oxide, magnesium oxide, and a calcium oxide, the solvent, etc. and making a slurry object.

[0034] Next, as shown in drawing 4 (b), said two or more ceramic green sheets 21 are divided to the field used as the insulating base 1 of the wiring substrate 4, and while performing predetermined punching processing and preparing the opening 23 grade for loading section 1a formation of a semiconductor device 3 in each partition, as it straddles between each partition, a breakthrough 22 is formed by mechanical drilling processing using a metal pin, laser processing, etc.

[0035] next, it is shown in drawing 4 (c) — as — the front face of said ceramic green sheet 21 — the object for external connection — while carrying out printing spreading of the conductive paste 24 used as a conductor 2 at a predetermined

pattern and carrying out the laminating of the ceramic green sheet 21 up and down after that, printing spreading of the conductive paste 24 is carried out at the internal surface of the breakthrough 22 of this layered product.

[0036] If it is the case where said conductive paste 24 is produced by adding and kneading an organic solvent, a binder, etc. to metal powder, such as copper, silver, and gold, for example, an insulating base 1 consists of a glass ceramic sintered compact of a HOU silicic acid system glass-aluminum-oxide system, a copper paste will be used suitably.

[0037] Moreover, printing spreading to breakthrough 22 internal surface of said conductive paste 24 gives vacuum attraction from the soffit side of a breakthrough while supplying conductive paste to the interior from the upper bed side of a breakthrough 22 through the screen platemaking manufactured to compensate for arrangement of a breakthrough 22, it meets breakthrough 22 internal surface, and as the conductive paste 24 of optimum dose remains and puts it, it is performed. In addition, if that viscosity is made into the range of 200-2500poise (20 - 25 Pa-S), since the viscosity of conductive paste 24 will become low moderately and will remain and stop easily being able to put the conductive paste 24 at this time at the internal surface of a breakthrough 22, While being able to make thin covering / spreading thickness of the conductive paste 24 in the central field of a breakthrough 22 with 8 micrometers - 12 micrometers as mentioned above It can be made to cover and apply in a soffit part, so that it may become thick with 1 / 0.45 to 1/0.75 time to a central field according to the effectiveness of the surface tension of conductive paste 24.

[0038] In this case, by having made viscosity of conductive paste low, it is desirable to make the mesh of a screen fine to about 200** - 400** extent so that it may not say that the amount of the conductive paste supplied in a breakthrough from screen platemaking increases too much.

[0039] In addition, adjustment of the viscosity of conductive paste can be performed by adjusting the class of the organic solvent and binder to add, an addition, the timing to add, mixing time, etc.

[0040] Next, as shown in drawing 4 (d) The division slot 25 which divides the field which serves as each insulating base 1 by putting slitting into the underside of the layered product which printing-apply, and the front face of the ceramic green sheet 21 and breakthrough 22 internal surface are made to put conductive paste 24, and grows into them with a cutter cutting edge or press metal mold is formed. At the end Many wiring substrates 4 are manufactured simultaneously intensively by calcinating this layered product, obtaining the aggregate with which two or more insulating bases 1 were formed in one into the mother substrate at the list in every direction, as shown in drawing 4 (e), and carrying out chocolate breaking of this aggregate along the division slot 25.

[0041] at this time, it is shown in drawing 5 (a) and (b) -- as -- the object for external connection -- a conductor 2 has the thick thickness in the corner formed on the underside and side face of a wiring substrate (becoming field), and the thickness in the central field of the thickness direction of an insulating base 1 (mother substrate) is thin. the field which be in close [of this division slot] although the division slot 25 be in close from the underside side of an insulating base 1 (mother substrate) to a certain amount of depth (line showed by R of drawing 5 (b)) -- the object for external connection -- since the thickness of a conductor 2 be thin, when carry out chocolate breaking of the mother substrate, extend and deform be prevent effectively. moreover, the object for external connection -- since the close division slot 25 is in the thick field of a conductor 2, big stress does not act at the time of chocolate breaking, and it does not extend and deform

[0042] According to the package for semiconductor device receipt using the wiring substrate 4 of this invention, in this way It is made to connect with a conductor 2 electrically through a bonding wire 5. loading section 1a of an insulating base 1 -- a semiconductor device 3 -- carrying -- a degree -- each electrode of said semiconductor device 3 -- the object for external connection -- Finally a lid 8 is joined to the top face of an insulating base 1 through the closure member 9 which consists of glass, resin, etc., and it becomes a semiconductor device as a final product by holding a semiconductor device 3 in the interior of the container which consists of an insulating base 1 and a lid 8 airtightly.

[0043] In addition, this invention is not limited to the above-mentioned example, and adding various modification and amelioration in the range which does not deviate from the summary of this invention does not interfere at all. For example, although the example which applied the wiring substrate to the package for semiconductor device receipt in the above-mentioned example was explained, this may be applied to a hybrid integrated circuit substrate.

[0044]

[Effect of the Invention] according to the wiring substrate of this invention -- the object for external connection -- the thickness in the corner field formed among conductors on the side face and underside of a wiring substrate, when thickness in the central field of T1 and the thickness direction of an insulating base is set to T2 From having considered as

0.4T1 <=T2 <=0.75T1 and 2<=12 micrometers of 8 micrometer<=T the object for external connection, even if big stress is added, when it can be made hard to make thin thickness in the central field of the thickness direction of an insulating base among conductors, and to extend and a mother substrate is divided (chocolate breaking) the object for external connection -- it can prevent effectively that do not stretch-deform, a conductor does not project greatly and the nonconformity on an appearance and a property occurs in a wiring substrate.

[0045] moreover -- simultaneously according to the wiring substrate of this invention -- the object for external connection -- the thickness T1 in the corner field formed among conductors on the side face and underside of an insulating base from a thick thing compared with T2 the object for external connection, when a conductor is connected to an external electrical circuit through low-melt point point low material the thickness of enough conductors to join low-melt point point low material firmly -- the insulating base lower circumference -- being securable -- low-melt point point low material and the object for external connection -- junction to a conductor can be strengthened and a wiring substrate can be firmly joined to an external electrical circuit substrate.

[0046] moreover -- according to the wiring substrate of this invention -- the side face of an insulating base -- setting -- the object for external connection -- from a soffit differing in the thickness of a conductor from a central field the object for external connection -- the outside surface of a conductor -- the soffit from a central field -- applying -- the shape of a curved surface, and the shape of non-plane [of stair-like **] -- changing -- this object for external connection, since the junction interface of a conductor and low-melt point point low material also becomes non-plane [-like] the object for external connection -- when stress, such as thermal stress, joins the junction interface of a conductor and low-melt point point low material, this stress is distributed in the many directions -- it can make -- the object for external connection -- connection dependability of the low-melt point point low material to a conductor can be made good, and connection dependability over the external electrical circuit substrate of a wiring substrate can be made good.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of one example of the wiring substrate of this invention.

[Drawing 2] It is the important section expanded sectional view of the wiring substrate shown in drawing 1 .

[Drawing 3] (a) and (b) are the important section expanded sectional views of other examples of the wiring substrate of this invention.

[Drawing 4] (a) Or (e) is the sectional view for every process showing an example of the manufacture approach of the wiring substrate shown in drawing 1 .

[Drawing 5] (a) and (b) are the important section amplification perspective views and important section expanded sectional views of the wiring substrate shown in drawing 4 .

[Description of Notations]

1 .... Insulating base
1a ... Loading section
2 .... the object for external connection -- a conductor
3 .... Semiconductor device
4 .... Wiring substrate
5 .... Bonding wire
6 .... wiring of an external electrical circuit substrate -- a conductor
7 .... Low-melt point point low material
A .... Corner field formed on the side face and underside of a wiring substrate
B .... Central field of the thickness direction of an insulating base
21 ... Ceramic green sheet
22 ... Breakthrough
23 ... Opening
24 ... Conductive paste

25 ... Division slot

R .... Close [of a division slot] is a line which shows the depth which is.

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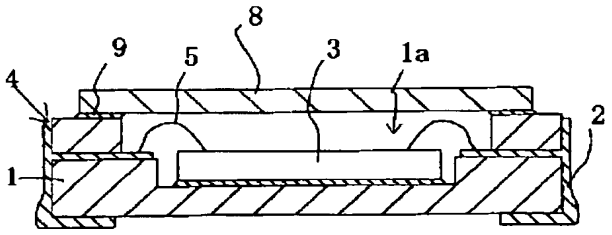
(54)【発明の名称】　配線基板

(57)【要約】
【課題】　外部接続用導体のうち、絶縁基体側面に形成された部位が、チョコレートブレーク時に延び変形して突起状の不良を発生させる。
【解決手段】上面に電子部品が搭載される搭載部１ａを有する絶縁基体１と、前記搭載部１ａ周辺から絶縁基体１の側面を介し下面に導出する外部接続用導体２とから成る配線基板であって、前記外部接続用導体２は配線基板１の側面と下面とで形成される角部領域Ａでの厚みをT_1、絶縁基体１の厚み方向の中央領域Ｂでの厚みをT_2としたとき、$0.4T_1 \leqq T_2 \leqq 0.75T_1$、$8\mu m \leqq T_2 \leqq 12\mu m$である。



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【特許請求の範囲】

【請求項１】上面に電子部品が搭載される搭載部を有する絶縁基体と、前記搭載部周辺から絶縁基体の側面を介し下面に導出する外部接続用導体とから成る配線基板であって、

前記外部接続用導体は配線基板の側面と下面とで形成される角部領域での厚みをT_1、絶縁基体の厚み方向の中央領域での厚みをT_2としたとき、０．４$T_1 \leqq T_2 \leqq$０．７５T_1、８μｍ$\leqq T_2 \leqq$１２μｍであることを特徴とする配線基板。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、半導体素子や容量素子等の電子部品を搭載するための配線基板に関し、詳しくは多数個取り基板を焼成した後にいわゆるチョコレートブレークにより個々の基板に分割して得られる配線基板に関する。

【０００２】

【従来技術】従来、半導体素子や容量素子等の電子部品を搭載するための配線基板は、一般に、酸化アルミニウム質焼結体から成り上面に電子部品の搭載部を有する絶縁基体と、タングステンやモリブデン等の高融点金属材料から成り絶縁基体の搭載部周辺から側面を介して下面に導出する外部接続用導体とから構成されている。

【０００３】そして、絶縁基体の搭載部に電子部品を搭載固定するとともに電子部品の各電極を搭載部周辺の外部接続用導体に電気的に接続した後、必要に応じて電子部品を蓋体や封止用樹脂で封止することにより製品としての電子装置となる。この電子装置は、外部接続用導体のうち絶縁基体の側面から下面に導出された部位が半田等の低融点ロウ材を介して外部電気回路に接続され、搭載された電子部品が外部接続用導体を介して外部電気回路と電気的に接続される。

【０００４】このような配線基板は、近時の電子装置の小型化に伴い、その大きさが数ｍｍ角程度の極めて小さなものとなってきており、その製作に際して、焼成後に絶縁基体用の母基板となる広面積のセラミックグリーンシート積層体に複数個分の絶縁基体となる領域を縦横の並びに配列して一体的に形成するとともに、この積層体の上下面に各々の絶縁基体となる領域に区画する分割溝を所定の深さで形成しておき、これを焼成して得た複数個の配線基板の集合体を分割溝に沿って分割（チョコレートブレーク）することによって、多数個を集約的に製作すること（多数個取り）が行なわれている。

【０００５】前記配線基板の外部接続用導体のうち、絶縁基体の搭載部周辺から側面にかけて導出される部位と、下面に形成される部位とは、母基板となるセラミックグリーンシートの表面に、タングステンやモリブデン等の導電ペーストをスクリーン印刷法で所定パターンに印刷塗布しておくことにより形成される。

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【０００６】また前記外部接続用導体のうち、絶縁基体の側面に被着形成される部位は、前記セラミックグリーンシート積層体の分割溝が形成される位置に、分割線に跨るようにして貫通孔を形成し、この貫通孔の内壁面に沿って導電ペーストを、外部接続用導体の搭載部周辺から導出される部位に接続するようにして印刷塗布しておくことにより形成される。この場合、前記配線基板の集合体を分割溝に沿って分割するときに貫通孔も２分割され、切り欠き部表面に印刷塗布・焼成された導電ペーストが配線基板の側面の外部接続用導体となる。

【０００７】また、セラミックグリーンシート積層体に形成された貫通孔の内壁面に対する導電ペーストの印刷塗布は、例えば、貫通孔の一端側から内部に導電ペーストをスクリーン製版等を介して供給するとともに貫通孔の他端側から真空吸引を施し、貫通孔内壁面に沿って適量の導電ペーストが残留・被着するようにして行なわれる。なお、このときの導電ペーストは、貫通孔内壁面に沿って適量が残留するように、約５００～１５００ポイズ（約５０～１５０Ｐａ・Ｓ）と比較的高くされており、塗布された導電ペーストはほぼ全域で約２０μｍ～２５μｍ程度の厚みとなっている。

【０００８】

【発明が解決しようとする課題】しかしながら、上述のように配線基板の集合体を分割溝に沿ってチョコレートブレークして得られた配線基板では、貫通孔の内壁面に塗布・形成された導電ペースト（外部接続用導体）の厚みが約２０μｍ～２５μｍと比較的厚く、応力が加わったときに延びやすいこと、また、分割溝がある程度の深さにまでしか到達しておらず、絶縁基体の厚み方向の中央領域において母基板が瞬間的に大きな引っ張り応力で破断されることにより分割されることになり、このときに外部接続用導体に大きな応力が加わることから、絶縁基体の側面に形成される外部接続導体の一部が外側に延びるようにして変形、突出してしまい、配線基板に外観不良や電気特性の不良等を生じてしまうという問題があった。

【０００９】特に、外部接続用導体の低電気抵抗化を図るため、絶縁基体をガラスセラミック焼結体等の低温焼成材料で形成し、外部接続用導体を低電気抵抗の銅、銀、金またはその合金等で形成する場合が多くなり、このような銅や銀、金は展性、延性が大きいことから、上述のような配線基板の側面の外部接続用導体の延び変形・突出の発生が顕著なものとなってきている。

【００１０】また外部接続用導体のうち、配線基板の側面に形成されるものは、ほぼ全域で同じ厚みであるため、上述のような外部接続用導体の延び・変形を防止するために導電ペーストの印刷量を減らして（全域で）塗布厚みが薄くなるようにすると、この外部接続用導体を外部電気回路に低融点ロウ材を介して接続したとき、外部接続用導体に対する低融点ロウ材の接合強度を確保す

ることができず、配線基板を外部電気回路に強固に接続することができない、という問題が誘発される。

【００１１】本発明は上記従来の問題に鑑み案出されたものであり、その目的は、例えば外部接続用導体が銅、銀等の展性、延性の大きな金属材料で形成されていたとしても、外部接続用導体に延び変形・突出等の問題が発生することがなく、かつ外部電気回路基板に強固に接続することが可能な配線基板を提供することにある。

【００１２】

【課題を解決するための手段】本発明の配線基板は、上面に電子部品が搭載される搭載部を有する絶縁基体と、前記搭載部周辺から絶縁基体の側面を介し下面に導出する外部接続用導体とから成る配線基板であって、前記外部接続用導体は配線基板の側面と下面とで形成される角部領域での厚みをT_1、絶縁基体の厚み方向の中央領域での厚みをT_2としたとき、$0.4T_1 \leqq T_2 \leqq 0.75T_1$、$8\mu m \leqq T_2 \leqq 12\mu m$であることを特徴とするものである。

【００１３】本発明の配線基板によれば、外部接続用導体のうち配線基板の側面と下面とで形成される角部領域での厚みをT_1、絶縁基体の厚み方向の中央領域での厚みをT_2としたとき、$0.4T_1 \leqq T_2 \leqq 0.75T_1$、$8\mu m \leqq T_2 \leqq 12\mu m$としたことから、外部接続用導体のうち絶縁基体の厚み方向の中央領域での厚みを薄くして延び難くすることができ、母基板を分割（チョコレートブレーク）するときに大きな応力が加わったとしても、外部接続用導体が大きく延び変形・突出することはなく、配線基板に外観・特性上の不具合が発生することを有効に防止することができる。

【００１４】また同時に、本発明の配線基板によれば、外部接続用導体のうち、絶縁基体の側面と下面とで形成される角部領域での厚みT_1がT_2に比べて厚いことから、外部接続用導体を低融点ロウ材を介して外部電気回路に接続したとき、低融点ロウ材を強固に接合させるのに十分な導体の厚さを絶縁基体下部周辺で確保することができ、低融点ロウ材と外部接続用導体との接合を強固とし、配線基板を外部電気回路基板に対して強固に接合することができる。

【００１５】また本発明の配線基板によれば、絶縁基体の側面において、外部接続用導体の厚みが下端と中央領域とで異なることから、外部接続用導体の外表面が中央領域から下端にかけて曲面状、階段状等の非平面状に変化し、この外部接続用導体と低融点ロウ材との接合界面も非平面状となるため、外部接続用導体と低融点ロウ材との接合界面に熱応力等の応力が加わったとき、この応力を多方向に分散させることができ、外部接続用導体に対する低融点ロウ材の接続信頼性を良好とし、配線基板の外部電気回路基板に対する接続信頼性を良好とすることができる。

【００１６】

【発明の実施の形態】次に、本発明を添付の図面に基づき詳細に説明する。図１は、本発明の配線基板を半導体素子収納用を収容する半導体素子収納用パッケージに適用した場合の一実施例を示し、１は絶縁基体、２は外部接続用導体である。これらの絶縁基体１および外部接続用導体２により半導体素子３を搭載するための配線基板４が形成される。

【００１７】前記絶縁基体１は、ガラスセラミック焼結体、酸化アルミニウム質焼結体等の電気絶縁材料から成り、その上面に半導体素子３を搭載する搭載部１ａを有し、該搭載部１ａに半導体素子３がガラス、樹脂、ロウ材等の接着材を介して接着固定、搭載される。

【００１８】この絶縁基体１は、いわゆる多数個取り用の母基板から製作される。具体的には、焼成後に絶縁基体１用の母基板となる広面積のセラミックグリーンシート積層体に複数個分の絶縁基体１となる領域を縦横に並べて一体的に配列形成し、この積層体の下面または上下面にカッター刃やプレス金型で切り込みを入れることにより各々の絶縁基体１となる領域を区画する分割溝を形成し、次にこれを焼成して絶縁基体１が母基板中に縦横の並びに複数個一体的に形成された集合体を得、この集合体を分割溝に沿ってチョコレートブレークすることによって、多数個が同時集約的に製作される。

【００１９】また前記絶縁基体１は、その上面の半導体素子３が搭載される搭載部１ａ周辺から側面を介し下面に導出する外部接続用導体２が被着形成されている。

【００２０】前記外部接続用導体２は、絶縁基体１の搭載部１ａ周辺の部分に半導体素子３の電極がボンディングワイヤ５等を介して接続され、また、図２に示すように、絶縁基体１の側面部分および下面部分が外部電気回路基板の配線導体６と低融点ロウ材７を介して接続される。

【００２１】このような外部接続用導体２は、例えば絶縁基体１がガラスセラミック焼結体から成る場合、絶縁基体１（母基板）となるセラミックグリーンシートの表面、およびセラミックグリーンシート積層体の各配線基板となる領域の側面に、銅、銀、金等の粉末を有機溶剤・バインダーと混練して成る導電ペーストを所定パターンに印刷塗布しておくことにより形成される。この場合、セラミックグリーンシート積層体の絶縁基体１の側面となる領域に導電ペーストを塗布できるように、あらかじめ貫通孔等の開口部をセラミックグリーンシート積層体に設けておく必要がある。セラミックグリーンシート積層体の絶縁基体１となる各領域の側面に印刷された導電ペーストは、焼成後、母基板をチョコレートブレークすることにより２分割され、外部接続用導体２のうち絶縁基体１の側面部分となる。

【００２２】なお、前記分割溝は母基板の下面から母基板の厚さの約１／５～１／３程度の深さで形成され、チョコレートブレークは、この分割溝に沿って下方に折り

曲げるように応力を加え、分割溝の到達していない母基板の厚み方向の中央領域を（引っ張り）応力で分断させることにより行なわれる。

【００２３】本発明においては、前記外部接続用導体２について、配線基板４の側面と下面とで形成される角部領域Ａでの厚みをT_1、絶縁基体１の厚み方向の中央領域Ｂでの厚みをT_2としたとき、０．４T_1≦T_2≦０．７５T_1、８μｍ≦T_2≦１２μｍとすることが重要である。

【００２４】前記外部接続用導体２について、絶縁基体１の厚み方向の中央領域Ｂでの厚みT_2を、０．４T_1≦T_2≦０．７５T_1、８μｍ≦T_2≦１２μｍの関係式を満足するように薄くすることにより、外部接続用導体２が銅等の展性、延性の大きな金属材料で形成されていたとしても延び難くすることができ、母基板を分割（チョコレートブレーク）するときに外部接続用導体２のうち、絶縁基体１の厚み方向の中央部分Ｂに大きな応力が加わったとき、外部接続用導体２が大きく延び変形・突出することはなく、配線基板４に外観・特性上の不具合が発生することを有効に防止することができる。

【００２５】また、外部接続用導体２のうち、絶縁基体１の側面と下面とで形成される角部領域Ａでの厚みT_1を厚くしていることから、外部接続用導体２を低融点ロウ材７を介して外部電気回路基板の配線導体６に接続したとき、低融点ロウ材７を強固に接合させるのに十分な導体の厚さを確保することができ、配線基板４を外部電気回路基板に強固に接合することができる。

【００２６】また、絶縁基体１の側面と下面とで形成される角部Ａから中央領域Ｂとで外部接続用導体２の厚みが異なることから、外部接続用導体２の外表面が前記角部Ａから中央領域Ｂにかけて非平面状（図２の例では曲面状）に変化し、この外部接続用導体２と低融点ロウ材７との接合界面も非平面状となるため、外部接続用導体２と低融点ロウ材７との接合界面に、絶縁基体１と外部電気回路基板との熱膨張係数の差に起因する熱応力等の応力が加わったとき、この応力を前記接合界面に沿って多方向に分散させることができ、外部接続用導体２に対する低融点ロウ材７の接続信頼性を極めて良好とすることができる。

【００２７】この場合、T_2＜８μｍと薄くなりすぎると、絶縁基体１の厚み方向の中央領域Ｂでの外部接続用導体２の厚みが不十分となり、外部接続用導体２と低融点ロウ材７との接合強度が不足し、配線基板４を外部電気回路基板に強固に接合することができず、またT_2＞１２μｍと厚くなりすぎると、母基板を分割溝に沿ってチョコレートブレークするときに外部接続用導体２に作用する応力により外部接続用導体２が外側に引っ張られて延び、変形して突起を発生させてしまう。したがって、前記外部接続用導体２の、絶縁基体１の厚み方向の中央領域Ｂでの厚みT_2は、８μｍ≦T_2≦１２μｍの範

囲とする必要がある。

【００２８】また、T_2＜０．４T_1となると、T_2に比べてT_1の厚みが大きくなり過ぎ、T_1の厚みの部分において外部接続用導体２の絶縁基体１に対する被着強度の低下等の不具合を生じさせてしまい、T_2＞０．７５T_1となると、T_1とT_2との厚みの差が小さいため、T_1の厚みの部分において外部接続用導体２の厚みが不十分になり、外部接続用導体２に低融点ロウ材７を強固に接合させることができず、配線基板４を外部電気回路基板に強固に接続することができなくなってしまう。したがって、前記外部接続用導体２について、配線基板４の側面と下面とで形成される角部領域Ａでの厚みをT_1、絶縁基体１の厚み方向の中央領域Ｂでの厚みをT_2としたとき、T_1およびT_2は０．４T_1≦T_2≦０．７５T_1の範囲とする必要がある。

【００２９】なお、前記外部接続用導体２について、厚みT_1の領域（配線基板４の側面と下面とで形成される角部領域Ａ）と厚みT_2の領域（絶縁基体１の中央領域Ｂ）との境界部分は、図２に示したように、厚みが連続して変化するように滑らかな曲面状につながるものに限らず、図３（ａ）（ｂ）に示すように、段状や傾斜面状につながるようにしてもよい。

【００３０】また、前記外部接続用導体２は、その露出表面に、ニッケルや銅、金等の耐食性、ボンディング性、低融点ロウ材の濡れ性等に優れた金属から成るめっき層を被着させておくと、外部接続用導体２の酸化腐食を効果的に防止することができるとともに、外部接続用導体２にボンディングワイヤ５や低融点ロウ材７をより一層確実・強固に接続することができる。従って、前記外部接続用導体２は、その露出表面に、ニッケル、銅、金等のめっき層（図示せず）を１～２０μｍの厚さ、例えばニッケルめっき層を１～１０μｍ、金めっき層を０．０３～３μｍの厚さとなるように被着させておくことが好ましい。なお、前記めっき層の厚さは、外部接続用導体２の部位に応じて適宜変えるようにしてもよく、例えば、ボンディングワイヤ５が接続される部位の金めっき層を１．５～３μｍと厚くしてボンディング性を高くし、低融点ロウ材７が接続される部位の金めっき層の厚さを０．０３～０．５μｍと薄くするようにして金－錫等の金属間化合物の生成を抑えて低融点ロウ材７の接続信頼性をより一層高めるようにしてもよい。

【００３１】次に、上述の配線基板４の製造方法の一例について図４（ａ）乃至（ｅ）に基づいて詳細に説明する。なお、図４（ａ）乃至（ｅ）において、図１乃至図３と同一部分には同一符号を付している。

【００３２】図４（ａ）乃至（ｅ）は上述の配線基板４の製造方法を説明するための各工程毎の断面図であり、まず図４（ａ）に示すように、広面積のセラミックグリーンシート２１を複数枚形成する。

【００３３】前記セラミックグリーンシート２１は、例

えば、絶縁基体１がガラスセラミック焼結体から成る場合、ホウ珪酸系ガラス、酸化アルミニウム、酸化マグネシウム、酸化カルシウム等の原料粉末に適当な有機バインダー、溶剤等を添加混合して泥漿物を作るとともに該泥漿物をドクターブレード法やカレンダーロール法等でシート状に成形することにより形成される。

【００３４】次に、図４（ｂ）に示すように、前記複数のセラミックグリーンシート２１を、配線基板４の絶縁基体１となる領域に区画し、各区画内に所定の打ち抜き加工を施し、半導体素子３の搭載部１ａ形成用の開口部２３等を設けるとともに、各区画間に跨るようにして貫通孔２２を、金属ピンを用いた機械的な穴あけ加工や、レーザー加工等で形成する。

【００３５】次に、図４（ｃ）に示すように、前記セラミックグリーンシート２１の表面に外部接続用導体２となる導電ペースト２４を所定パターンに印刷塗布し、その後、セラミックグリーンシート２１を上下に積層するとともに、この積層体の貫通孔２２の内壁面に導電ペースト２４を印刷塗布する。

【００３６】前記導電ペースト２４は、銅、銀、金等の金属粉末に有機溶剤・バインダー等を添加、混練することにより作製され、例えば、絶縁基体１がホウ珪酸系ガラス－酸化アルミニウム系のガラスセラミック焼結体からなる場合であれば銅ペーストが好適に使用される。

【００３７】また、前記導電ペースト２４の貫通孔２２内壁面への印刷塗布は、例えば、貫通孔２２の配置に合わせて製作したスクリーン製版を介して導電ペーストを貫通孔２２の上端側から内部に供給するとともに貫通孔の下端側から真空吸引を施し、貫通孔２２内壁面に沿って適量の導電ペースト２４が残留・被着するようにして行なわれる。なお、このときの導電ペースト２４は、その粘度を２００～２５００ポイズ（２０～２５Ｐａ・Ｓ）の範囲としておくと、導電ペースト２４の粘度が適度に低くなり貫通孔２２の内壁面に残留・被着しにくくなるため、貫通孔２２の中央領域での導電ペースト２４の被着・塗布厚みを上述のように８μｍ～１２μｍと薄くすることができるとともに、下端部分では導電ペースト２４の表面張力の効果により中央領域に対して１／０．４５～１／０．７５倍と厚くなるように被着・塗布させることができる。

【００３８】この場合、導電ペーストの粘度を低くしたことによりスクリーン製版から貫通孔内に供給される導電ペーストの量が多くなりすぎる、ということがないように、スクリーンのメッシュを、例えば約２００＃～４００＃程度に細かくしておくことが好ましい。

【００３９】なお、導電ペーストの粘度の調整は、添加する有機溶剤・バインダーの種類や添加量、添加するタイミング、混練時間等を調節すること等により行なうことができる。

【００４０】次に、図４（ｄ）に示すように、セラミックグリーンシート２１の表面および貫通孔２２内壁面に導電ペースト２４を印刷塗布・被着させて成る積層体の下面にカッター刃やプレス金型で切り込みを入れることにより各々の絶縁基体１となる領域を区画する分割溝２５を形成し、最後に、この積層体を焼成して、図４（ｅ）に示すように絶縁基体１が母基板中に縦横の並びに複数個一体的に形成された集合体を得、この集合体を分割溝２５に沿ってチョコレートブレークすることによって、多数個の配線基板４が同時集約的に製作される。

【００４１】このとき、図５（ａ）および（ｂ）に示すように、外部接続用導体２は、配線基板（となる領域）の下面と側面とで形成される角部での厚さが厚く、絶縁基体１（母基板）の厚み方向の中央領域での厚さが薄くなっている。分割溝２５は絶縁基体１（母基板）の下面側からある程度の深さ（図５（ｂ）のＲで示した線）までしか入っていないが、この分割溝の入っていない領域では外部接続用導体２の厚みが薄いため、母基板をチョコレートブレークするときに延びて変形することが効果的に防止される。また、外部接続用導体２の厚い領域には分割溝２５が入っているためチョコレートブレーク時に大きな応力が作用することはなく、延び変形することはない。

【００４２】かくして本発明の配線基板４を用いた半導体素子収納用パッケージによれば、絶縁基体１の搭載部１ａに半導体素子３を搭載し、次に前記半導体素子３の各電極を外部接続用導体２にボンディングワイヤ５を介して電気的に接続させ、最後に絶縁基体１の上面に蓋体８をガラス、樹脂等から成る封止部材９を介して接合させ、絶縁基体１と蓋体８とから成る容器内部に半導体素子３を気密に収容することによって最終製品としての半導体装置となる。

【００４３】なお、本発明は上記実施例に限定されるものではなく、本発明の要旨を逸脱しない範囲での種々の変更・改良を加えることは何ら差し支えない。例えば、上記実施例においては配線基板を半導体素子収納用パッケージに適用した例について説明したが、これを、混成集積回路基板に適用してもよい。

【００４４】

【発明の効果】本発明の配線基板によれば、外部接続用導体のうち配線基板の側面と下面とで形成される角部領域での厚みをT_1、絶縁基体の厚み方向の中央領域での厚みをT_2としたとき、$0.4T_1 \leqq T_2 \leqq 0.75T_1$、$8\mu m \leqq T_2 \leqq 12\mu m$としたことから、外部接続用導体のうち絶縁基体の厚み方向の中央領域での厚みを薄くして延び難くすることができ、母基板を分割（チョコレートブレーク）するときに大きな応力が加わったとしても、外部接続用導体が大きく延び変形・突出することはなく、配線基板に外観・特性上の不具合が発生することを有効に防止することができる。

【００４５】また同時に、本発明の配線基板によれば、

外部接続用導体のうち、絶縁基体の側面と下面とで形成される角部領域での厚みT_1がT_2に比べて厚いことから、外部接続用導体を低融点ロウ材を介して外部電気回路に接続したとき、低融点ロウ材を強固に接合させるのに十分な導体の厚さを絶縁基体下部周辺で確保することができ、低融点ロウ材と外部接続用導体との接合を強固とし、配線基板を外部電気回路基板に対して強固に接合することができる。

【００４６】また本発明の配線基板によれば、絶縁基体の側面において、外部接続用導体の厚みが下端と中央領域とで異なることから、外部接続用導体の外表面が中央領域から下端にかけて曲面状、階段状等の非平面状に変化し、この外部接続用導体と低融点ロウ材との接合界面も非平面状となるため、外部接続用導体と低融点ロウ材との接合界面に熱応力等の応力が加わったとき、この応力を多方向に分散させることができ、外部接続用導体に対する低融点ロウ材の接続信頼性を良好とし、配線基板の外部電気回路基板に対する接続信頼性を良好とすることができる。

【図面の簡単な説明】

【図１】本発明の配線基板の一実施例の断面図である。

【図２】図１に示す配線基板の要部拡大断面図である。

【図３】（ａ）、（ｂ）は本発明の配線基板の他の実施＊例の要部拡大断面図である。

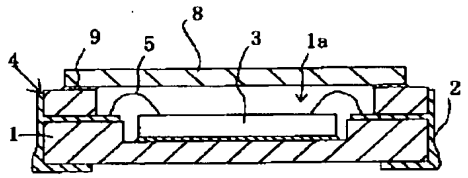
【図４】（ａ）乃至（ｅ）は図１に示す配線基板の製造方法の一例を示す工程毎の断面図である。

【図５】（ａ）、（ｂ）は図４に示す配線基板の要部拡大斜視図及び要部拡大断面図である。

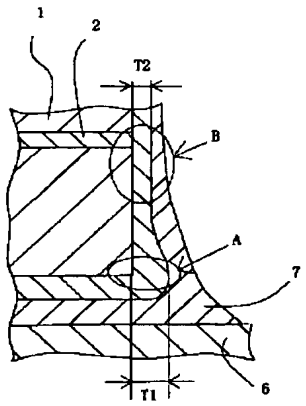
【符号の説明】

１・・・・絶縁基体
１ａ・・・搭載部
２・・・・外部接続用導体
３・・・・半導体素子
４・・・・配線基板
５・・・・ボンディングワイヤ
６・・・・外部電気回路基板の配線導体
７・・・・低融点ロウ材
Ａ・・・・配線基板の側面と下面とで形成される角部領域
Ｂ・・・・絶縁基体の厚み方向の中央領域
２１・・・セラミックグリーンシート
２２・・・貫通孔
２３・・・開口部
２４・・・導電ペースト
２５・・・分割溝
Ｒ・・・・分割溝の入っている深さを示す線

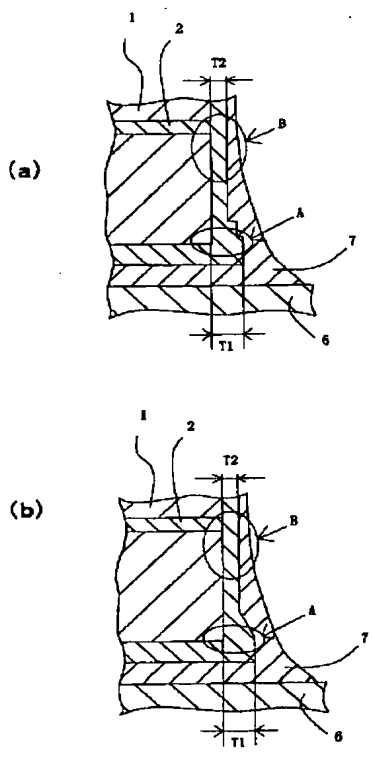
【図１】



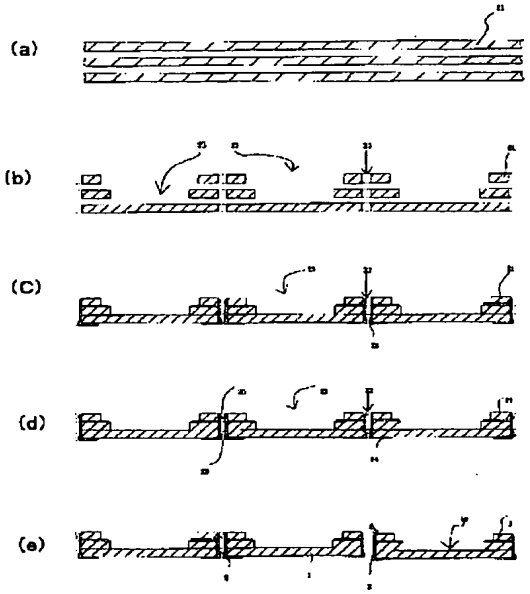
【図２】



【図３】



【図４】



【図５】